



**Washington State  
Department of Transportation**

## Memorandum

Date: December 29, 2005  
TO: Ed Barry/Zak Griffith  
NW Region Project Office, NB 82-75  
FROM: Tony Allen/Andrew Fiske  
E&EP Geotechnical Branch, MS 47365  
SUBJECT: SR-405, XL-2406  
Canyon Park Freeway Station Pedestrian Bridge  
Summary of Geotechnical Conditions

Attached with this memorandum is the *Summary of Geotechnical Conditions* for inclusion in the *Contract*. An electronic copy will also be made available to the Northwest Region.

The documents listed as available geotechnical reports and/or memorandums should be made available either at the Project Engineer's office for review by prospective bidders. Logs of all the borings referenced in the *Summary* and included in the listed reports and/or memorandums should be included in the *Contract*.

If you have questions or require further information, please contact Tony Allen at (360) 709-5450 or Andrew Fiske at (360) 709-5456.

TMA:ajf

Enclosure

cc: Mark Anderson/Brian Aldrich, Bridge & Structures, 47340

## SUMMARY OF GEOTECHNICAL CONDITIONS

The following is a summary of the geotechnical conditions and their potential impacts on the construction of the Canyon Park Pedestrian Bridge and associated retaining walls.

### Subsurface Conditions

Based on our field explorations, the project site appears generally underlain by fill and glacial deposits. Fill was observed in all of the test borings and generally consists of silty sand to poorly graded sand with silt and/or gravel in a loose to dense and moist to wet condition. Typically, the fill was less than 10 feet thick, and was likely placed during original construction of SR-405 and the interchange. Below the fill, a well graded to poorly graded sand with silt and/or gravel (Recessional Outwash) in a loose to medium dense and moist to wet condition. This unit was observed across the project site extending to between 25 and 35 feet below the existing ground surface. Below the Recessional Outwash, a deposit of clean, poorly graded sands to cemented silty sand (Glacial Till) in a dense to very dense and moist to wet condition was observed. This unit extended to the limits of most of the explorations, except for the shallow test holes (H-8 through H-12) that never penetrated the Recessional Outwash. A very dense clean, moist to wet, poorly graded to well graded sand with varying amounts of fine gravel (Advance Outwash) was observed in test holes H-3-05, H-5-05, H-6-05, and H-7-05 below the recessional outwash and/or glacial till. The attached boring logs contain further detail concerning the subsurface conditions.

### Ground and Surface Water

Evidence of groundwater was observed in all of the test holes performed for this study. In general, groundwater was observed at the contact between the fill and recessional outwash units, or between 10 and 15 feet below the existing ground surface. Open stand pipe piezometers were installed in test holes H-2-05, H-6-05 and H-8-05. The groundwater depth encountered during drilling and subsequent monitoring is included in the table below. It should be anticipated that the groundwater level may vary with time of year, amount of precipitation, and other factors.

#### *Depth Below Ground Surface to Ground Water*

Boring (Surface Elevation, ft)	Date of Measurement (Measurement in feet, bgs)							
	4/11/05	4/12/05	4/13/05	4/14/05	4/19/05	4/20/05	7/19/05	12/13/05
H-1-05 (141.0)					12.5*			
H-2-05 (138.1)					11.5*		12.3	12.2
H-3-05 (133.0)				12.0*				
H-4-05 (126.8)		11.5*						
H-5-05 (125.6)			11.2*					
H-6-05 (124.1)					6.5*		6.9	6.5
H-7-05 (124.8)	8.9*							
H-8-05 (127.4)		6.0*					6.9	6.8
H-9-05 (127.1)		6.0*						
H-10-05 (162.9)			18.0*					
H-11-05 (123.3)						2.0*		
H-12-05 (124.9)				5.0*				

\* At time of Drilling

## **Construction Considerations for Various Project Elements**

### *Driven Displacement Piles for Pedestrian Bridge*

Borings H-1-05 through H-7-05 were conducted at each of the proposed pedestrian bridge foundation elements. The minimum tip elevation is recommended to limit potential pile settlement. Based on our pile drivability analysis, and soils similar to those observed in the test borings, the pile should sustain little to no damage due to the driving operation through the upper sand layers. In our opinion, the pile tip will not penetrate into the underlying glacial till layer (approximately 30' below the existing ground) when the pile tip reaches the glacial till layer driving operations should conclude. It is possible that excavations for the pile supported tower footing and some of the pile caps may be at or just below the groundwater table. Dewatering of the excavations may be necessary. During construction of the pile cap, Piers 2 through 4, may require temporary shoring to support I-405. Dense soil conditions will make sheet pile difficult to install. Drilled soldier pile and lagging shoring may be required. Groundwater at the contact with the dense soils may cause caving, necessitating the use of wet construction methods or temporary casing for soldier pile installation.

### *Sign and Signal Pole Foundations*

Groundwater should be expected during construction of the ramp meter signal pole foundation. At this location, groundwater was observed during test drilling at a depth of 5 feet below the existing ramp pavement. The soil conditions below the water table include loose, clean sandy soils which are susceptible to caving and "running." The foundation contractor should be prepared to use temporary casing and/or drilling slurry to maintain the sidewalls of the excavation, and prevent bottom heave.

### *Storm Water Detention Pond*

Test holes H-8-05, H-9-05 and H-11-05 were placed near the proposed storm water detention pond expansion. Groundwater in these test holes was encountered at a depth of approximately 5 feet below the existing ground surface (or less). Thus, the existing groundwater table is approximately 6' above the base of the pond. Excavations for the pond expansion below the groundwater table will require dewatering. Due to the depth of groundwater above the proposed pond floor, an extensive dewatering system may be needed (i.e. wellpoints, deep wells, and/or eductors). The site soils are moisture sensitive and may be difficult to work with during earth moving operations. Ineffective dewatering systems will likely lead to pumping or wet "mucky" soils in the bottom of the excavations. The contractor may need to take additional measures to ensure that fine grained soils do not migrate or cause turbidity problems and environmental violations.

## Available Geotechnical Reports

The following report contains design and construction information relevant to the project and is available at the Project Engineer's Office:

Tony Allen and Andrew Fiske, *Geotechnical Report*, Canyon Park Freeway Station, King County, Washington, December 29, 2005.

